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TRICKLE MOUNTAIN Forage Allocation Research

Report No. 5
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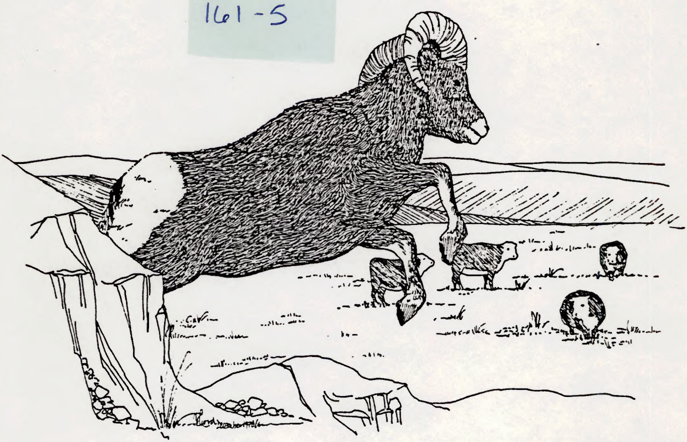

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PROGRESS REPORT: TRICKLE MOUNTAIN RESEARCH STUDY

Contract No. YA-512-CT8-22

July 1, 1980

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I. ABSTRACT

This report summarizes work on the Trickle Mountain Research Study (Contract No. YA-512-CT8-22) during October 1, 1979 through March 31, 1980. Field work on the project was completed in December of this period. Field work included final fecal collections from cattle and clipping of caged utilization plots on critical bighorn areas utilized by cattle. Data on food habits of wild ungulates indicated that 9 plant genera accounted for most of their year-round diets. Data on habitat use and food habits of cattle and bighorn sheep and forage production on bighorn critical areas indicated that there was little mutual use of limiting resources. However, there are significant variations in overlap among allotments. While overlap in the species food habits was moderate, overlap in geographic distributions of cattle and sheep was minimal.

II. OBJECTIVES

A. Overall Program Objectives:

To determine use of and competition for forage by livestock, mule deer, elk, antelope and bighorn sheep by habitat types and seasons in the Trickle Mountain Wildlife Habitat Area and to identify opportunities for habitat improvement and management.

B. Specific Study Objectives:

1.) Determine forage use by mule deer, elk, antelope, bighorn sheep and domestic livestock by habitat sites and season in the Trickle Mountain Area. Determine diet overlap and potential for competition. Determine diet overlap and potential for competition. Determine gross forage carrying capacity for all ungulates.

2.) Develop a model that will define alternative forage allocations for big game and livestock from the above data.

3.) Propose potential habitat improvements and management that will produce alternative carrying capacities for big game and livestock simultaneous with ecosystem integrity and environmental quality based on information obtained during the study. These will include, but not be limited to:

a.) vegetation manipulation
b.) controlled burning
c.) fencing
d.) seeding and planting
e.) livestock grazing systems; and
f.) big game harvest, trapping and transplanting

III. PROCEDURES

A. General

This report summarizes work on the project from October 1, 1979 through March 31, 1980.

Field work was completed during this period with final clipping of utilization plots and collection of the last livestock fecal samples in October by Scott McCollough. Scott returned to Fort Collins in December and spent the remainder of the period analyzing data and writing his thesis.

Several presentations and briefings on the project occurred during the period. In October, 1979 June Hall of the National Wildlife Federation in Washington, DC visited the study area with Bill Luscher and Ernie Gluesing, Colorado State Office (BLM), and John Schwarz, Alamosa Area Office (BLM). All were briefed on the project by Allen Cooperrider.

In February, 1980 representatives from the Colorado State Office, Canon City District Office and Alamosa Area Office were briefed on the project in Fort Collins. Also in February, a paper on "Forage Allocation Between Big Game and Livestock" was presented at the annual meeting of the Colorado Chapter of the Wildlife Society in Glenwood Springs, CO. An Abstract of that presentation is in Appendix A. In March, a presentation on the project was made by Allen Cooperrider to the visiting scientist seminar at CSU.

B. Data Collection

1.) Habitat Use. From October 1 - November 30, 1979, an additional 14 groups of wild ungulates were observed. This represented approximately 110 individual animals. During October, 30 groups of cattle were observed. Cattle observations included data on characteristics of foraging areas (vegetation type, slope, aspect, and distance from water).

2.) Food Habits. In October fecal samples were collected from cattle observed on the Trickle Mountain allotment. This was the final fecal collection. Although the Robb Ranch allotment was open to cattle use, no cattle were observed on this allotment during a search conducted November 28-30.

3.) Forage Production and Utilization. The "range cage" method was used to estimate forage utilization by cattle on 21 areas identified as critical bighorn winter-spring range. Each of the 21 "critical areas" was divided into 3 strata, each stratum representing presumed differences in cattle grazing pressure. Stratification was based on: (a) distance from cattle concentrations, (b) distance from water or salt, (c) slope, and (d) distance up slope. Heaviest grazing pressure was expected in stratum 1. It was anticipated that strata 2 and 3 would receive medium and light grazing, respectively.

Prior to the grazing season, a pair of circular, 0.46 sq. m plots was randomly located in each stratum on all 21 critical areas. A wire cage protected one plot of each pair from grazing. From October 1-10, after cattle were removed from BLM land, forage in all plots was clipped. The clippings were air-dried and weighed.

Observations of cattle and wild ungulates observed on critical

areas had been recorded during summer and early fall to indicate which species was responsible for the grazing.

4.) Weather records. Weather records from Saguache for 25 years (1955-1979) were obtained, coded, keypunched and summarized. Measurements utilized were maximum and minimum daily temperatures, daily precipitation, and snow on ground. For purposes of modeling these data were summarized by 2-week periods.

C. Data Analysis

1.) Habitat Use. Cattle observations for the 1979 grazing season were plotted on topographic maps as were bighorn observations made during winter and spring of 1978 and 1979. The percentage of winter-spring bighorn range used by cattle was estimated. Percentages of cattle groups and bighorn bands observed within each category as vegetation, slope, aspect, and distance from water were calculated.

2.) Food Habits. Microscopic analysis of fecal samples was completed during this period and data have been coded and keypunched for computer assisted analysis. All data on wild ungulate food habits have been summarized by seasons as well as by 2-week periods. An analysis of sources of variation in bighorn food habits has been made for presentation at the Northern Wild Sheep and Goat Conference in April. This analysis utilized both data from this study and also data from the study area reported by Todd (1975).

3.) Forage Production and Utilization. SVIM field data have not yet been processed by the Denver Service Center.

Forage production from caged plots on bighorn winter-spring critical aras was analyzed on an allotment basis. Weights of forage in caged plots (n=66) were used to estimate standing crops of forage on the 21 bighorn critical areas.

IV. RESULTS AND DISCUSSION

A. Habitat Use and Distribution

Distribution. From May to October, cattle used only limited portions of the Poison Gulch, Trickle Mountain, and Cross Creek allotments. On the Poison Gulch allotment, cattle were observed along Middle and Ford Creeks and in Poison Gulch. Areas of cattle concentration on the Trickle Mountain allotment included Antelope Creek and Houghland Gulch. Most cattle on the Cross Creek allotment ranged along Jack's Creek (Fig. 1).

Most bighorn winter-spring range was located on 3 allotments that were under intensive study. A large segment of the herd, however, used a lambing ground west of these BLM allotments during May to about mid-August.

The herd had 2 apparently separate winter ranges (Fig. 1) an

area south of Trickle Mountain and the Poison Gulch-Ford Creek area. In spring, bighorn moved to Lone Tree Gulch, the east side of Alkali basin, Jack's Creek, and Middle Creek.

Only about 4 percent of the winter-spring bighorn range was used by cattle during May-October (Fig. 1). Although cattle groups were observed on 7 critical areas, observations were consistently made only on those critical areas near Jack's Creek on the Cross Creek allotment.

Habitat Use. Bighorn usually used areas with steeper slopes than did cattle (Fig. 2). The median slope angle for all bighorn observations was 20° while the median slope for cattle observations was 2°. Over 75 percent of all observed cattle groups were on slopes of 5° or less.

Distribution of cattle was further restricted by a limited water supply. Approximately 50 percent of observed cattle groups were within 240 m of water (Fig. 3). Bighorn distribution also appeared related to the distribution of water. Half of all bands observed were within 300 m of water. However, much of the escape terrain used by bighorn borders streams. These areas provided not only escape terrain but abundant streamside forage as well as water. The relative values of these 3 factors to bighorn of the Trickle Mountain area are unclear.

Both cattle and bighorn preferred the more open vegetation types (Fig. 4). The limited amount of meadow type with its abundant forage accounted for about 8 percent of bighorn observations and 9 percent of cattle observations. Both species used the extensive shortgrass and shortgrass-pingue types. Cattle were not observed in the dry pinyon-juniper type nor in the cliff type. Bighorn generally avoided rabbitbrush types found in gulches. Bighorn did not use the ponderosa pine-Douglas fir forests which accounted for 4 percent of cattle observations. No cattle observations and only a small percentage of bighorn observations were made in limited amounts of mixed grass and mountain shrub types.

There were no major differences between cattle and bighorn in their uses of aspects available on the study area (Fig. 5). Bighorn relied heavily on southerly aspects which were snow-free in winter. Cattle showed a slightly higher use of northerly aspects and a greater tendency to use level areas.

Potential Bighorn Habitat. The heights and lengths of 18 cliffs used by bighorn for escape were estimated. The minimum height and length were 8 m and 200 m, respectively. Escape terrain was usually characterized by sparse vegetation, southerly aspect, and steep slope. Of all bands observed, 90 percent were within 240 m of such escape terrain. This information and data on foraging habitat were used as criteria for identifying and determining the sizes of potential but currently unused winter-spring ranges for bighorn.

B. Food Habits

Wild Ungulates. Seasonal food habits for all wild ungulates in

1978 are summarized in Table 1-5 (Appendix B). A total of 85 genera consisting of 22 grass, 38 forb, and 25 browse genera were discerned in fecal samples. Only 9 genera were found in sufficient abundance to account for over 5% of any year-round diet. These consisted of 3 grasses (*Muhlenbergia* sp.) and fescues (*Festuca* sp.) and sedges (*Carex* sp.) and 6 browses, saltbush (*Atriplex canescens*), rabbitbrush (*Chrysothamnus* sp.), sagebrush (*Artemisia* sp.), willow (*Salix* sp.), mountainmahogany (*Cercocarpus montanus*) and juniper (*Juniperus* sp.).

The grasses and grasslike plants were eaten primarily by bighorn sheep and elk. Similarly, rabbitbrush composed a significant percentage of the diet only for pronghorn,and willow and juniper were important mostly for mule deer. Saltbush and sagebrush, however, were eaten in substantial quantities by all 4 wild ungulates. Most of the sagebrush on the fall-winter-spring range is fringed sagebrush (*A. frigida*). Therefore, it is presumed that fringed sagebrush was the single most abundant species in the year-round diet of all 4 species except deer. The year-round diet of deer contained slightly more willow than fringed sagebrush. Literature on fringed sagebrush has been reviewed and a paper is being prepared based on the review. There is substantial evidence that fringed sagebrush has high palatability and nutritional value for many wild and domestic ungulates, is able to reseed well, and at the population level is highly resistant to grazing.

An analysis of sources of variation in food habits of bighorn sheep revealed that food habits may vary significantly between seasons, sites and years, but are similar among 2-week periods within seasons. These results suggest that food habits data from a limited number of seasons, years or sites should be interpreted with caution.

Bighorn Sheep and Cattle. Analysis of fecal samples collected during May-October, 1978 from all BLM allotments showed a predominance of grasses and grass-like plants in the cattle diet (Table 6). Most of the browse in the "summer" diet was consumed in September and October. Forb consumption was insignificant.

Analysis of bighorn fecal samples collected in late 1978 and 1979 from winter-spring range demonstrates that bighorn also consumed grasses and sedges abundantly (Table 6). Bighorn browsed more than did cattle, with fringed sage especially important in their diet. Few forbs were taken.

Summer diets of cattle and winter-spring diets of bighorn were compared using Kulcysnski's index (Oosting 1956): Similarity Index = $[\Sigma 2w/\Sigma(a+b)]x100$, where w is the lesser percentage of a food item in the 2 diets and a+b is the sum of percentages of food items in the 2 diets. The index represents the percent of 2 diets that is shared between 2 herbivore species. Indices reported below were calculated only for those food items constituting at least 1 percent of either the cattle or bighorn diets.

Comparing the summer diet of cattle on all BLM land on the study

area to the winter-spring diet of bighorn produced a similarity index of 73. Comparing cattle diets for the 3 major allotments within bighorn range to the bighorn diet produced the following similarity indices: Poison Gulch, 65; Trickle Mountain, 62; and Cross Creek, 62.

C. Forage Production and Utilization

Standing crops of forage and rates of forage removal on bighorn winter-spring critical areas were calculated by allotment (Table 7). The Cross Creek allotment produced the largest standing crop of forage on bighorn critical areas, followed by the Trickle Mountain allotment and, lastly, the Poison Gulch allotment. Likewise, the estimated amount of forage removed from critical areas during the 1979 cattle grazing season was greater on the Cross Creek allotment (35 percent) than on either the Trickle Mountain or Poison Gulch allotments (7 and 4 percent, respectively). Based on the relative numbers of cattle, bighorn, pronghorn (*Antilcapra americana*), and mule deer (*Odocoileus hemionus*) observed on critical areas during June-October, 1979 (Table 8) and considering that a cow consumes much more forage than does any of these wild ungulates, it is concluded that most of this forage was removed by cattle.

The indicated low levels of forage use by cattle on 13 bighorn critical areas on the Poison Gulch and Trickle Mountain allotments is supported by the above-noted observation that there was little overlap between cattle distribution and bighorn winter-spring distribution on these allotments. Furthermore, on the Cross Creek allotment, over half of the measured summer forage removal occurred on 1 of 8 critical areas. Most cattle observed on Cross Creek critical areas were also sighted on this 1 area.

D. Bighorn/Cattle Competition

Interspecific competition occurs when there is mutual use of resources that are limiting to one or both species. This study demonstrated little mutual use of forage resources by cattle in summer and bighorn in winter and spring on the Trickle Mountain study area. While overlap in the species' food habits was moderate, overlap in geographic distributions of cattle and sheep was minimal. Separation of cattle and bighorn ranges has also been reported by McCullough and Schneegas (1966) and Dean (1975). On the Trickle Mountain area, separation of the ranges of cattle and bighorn was due mostly to the reluctance of cattle to use steep slopes or to wander far from water.

V. LITERATURE CITED

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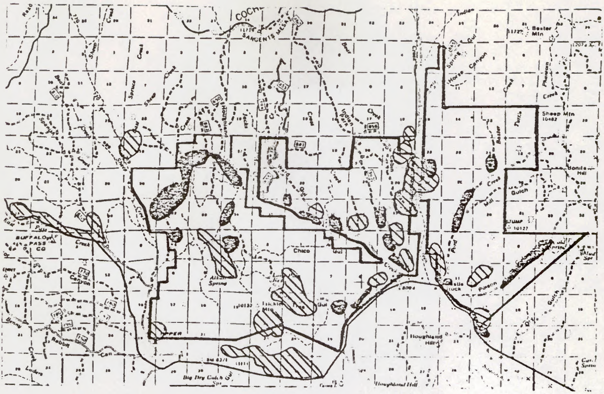

Fig. 1. Distribution of bighorn during December - June, 1978-79 (crosshatch) compared to distribution of cattle during May - October, 1979 (shading) at the Trickle Mountain Study Area.

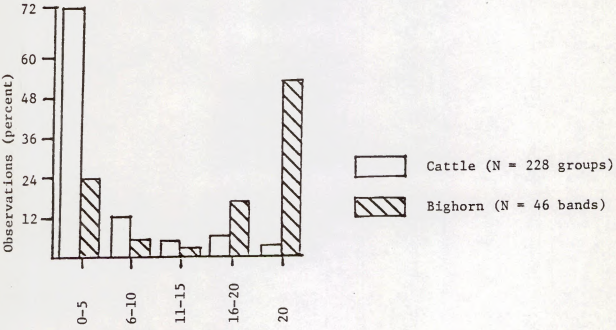

Fig. 2. Slopes used by cattle during summer and by bighorn during winter and spring on the Trickle Mountain Study Area, December, 1978 - October, 1979.

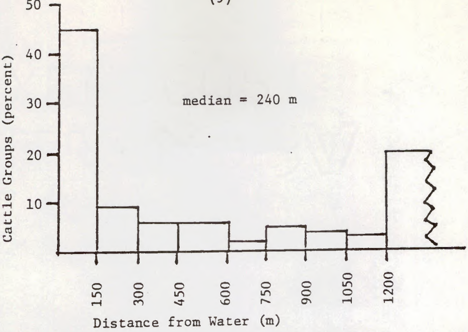

Fig. 3. Distance of 230 observed cattle groups from water on the Trickle Mountain Study Area during May - October, 1979.

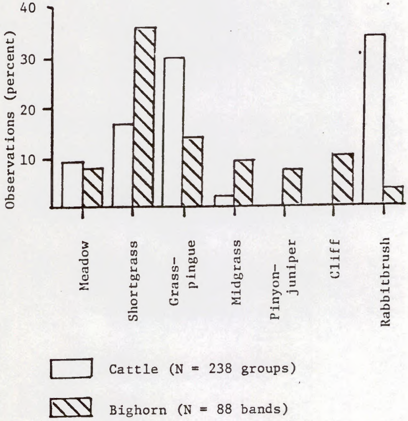

Fig. 4. Vegetation types used by cattle during summer and by bighorn during winter and spring on the Trickle Mountain Study Area, December, 1978 - October, 1979.

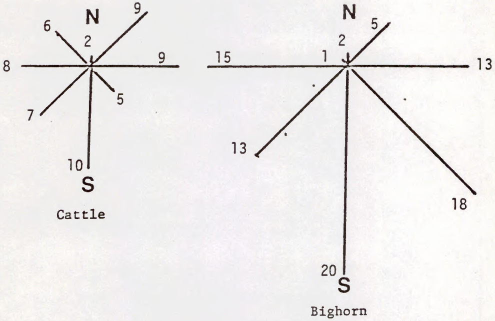

Fig. 5. Aspects used (percent) by 234 groups of cattle during summer and by 88 bands of bighorn during winter and spring on the Trickle Mountain Study Area, December, 1978 - October, 1979.

VI. APPENDICES

A. Abstract: Forage Allocation Between Big Game and Domestic Livestock

B. Tables 1-8.

Appendix A. Forage Allocation Between Big Game and Domestic Livestock.

by Allen Y. Cooperrider, U.S. Bureau of Land Management, and James A. Bailey, Colorado State University.

Abstract: A computer simulation model is being developed to predict impacts upon ungulates of selective forage removal by free-ranging big game and domestic livestock. The model predicts forage removal from a set of habitat types as a function of the standing crops of forage, densities of big game and livestock, seasonal trends in animal distribution and forage preferences, weather patterns and previous forage removal. Predicted forage removal by ungulates is used to estimate trends in qualities of diets. Impacts upon weight changes, reproduction and mortality are predicted from diet qualities and nutritional requirements of animal species. The model is being developed using data from the Trickle Mountain area of the northern end of the San Luis Valley. The area is grazed year-round by bighorn sheep and pronghorn antelope and seasonally by mule deer, elk, cattle, and horses. Data on forage production and on food habits and distribution of all six species have been collected for 2 years. These data together with data on ungulate population levels, weather patterns, and basic ungulate biology will be integrated in the computer model.

Paper presented at Annual Meeting, Colorado Chapter, The Wildlife Society, January 29-February 1, 1980, Glenwood Springs, CO.

Table 1. FOOD HABITS SUMMARY FOR PERIOD WINTER 1976

PER CENT RELATIVE DENSITY OF PLANT FRAGMENTS DISCERNED IN FECAL MATTER

		BIGHORN SHEEP		PRONGHORN ANTELOPE		MULE DEER		ELK	
		MEAN	SE	MEAN	SE	MEAN	SE	MEAN	SE
GRASS AND GRASSLIKE PLANTS									
FESTUCA SPP.	FESCUE	5.04	.73	.28	.37	1.39	.86	7.26	1.06
MUHLENBERGIA SPP.	MUHLY	6.75	1.35	.59	.25	.57	.26	2.74	.39
CAREX SPP.	SEDGE	1.71	.33	.43	.46	1.52	.23	2.43	.33
OTHER GRASS		8.55		1.59		1.40		11.65	
TOTAL GRASS		22.05		2.89		4.87		24.12	
FORBS									
OTHER FORBS		2.41		1.71		5.01		2.00	
TOTAL FORBS		2.41		1.71		5.01		2.00	
BROWSE									
JUNIPERUS SPP.	JUNIPER	.53	1.33	.34	.28	11.53	1.24	.15	.16
PINUS SPP.	PINE	1.59	.44	.61	.36	6.83	1.26	4.22	.47
PSEUDOTSUGA SPP.	DOUGLAS FIR	.84	.31	.66	.27	6.74	1.80	7.55	.82
YUCCA SPP.	YUCCA	4.55	.57	.05	.10	.39	.24	5.26	.72
ATRIPLEX SPP.	SALTBUSH	7.71	1.15	5.64	1.03	13.17	1.53	2.02	.56
EUROTIA SPP	WINTERFAT	4.34	.98	.05	.11	3.22	1.73	1.85	.68
CHRYSOTHAMNUS SPP.	RABBITBRUSH	.37	.14	18.47	1.67	4.21	.70	3.59	.61
ARTEMISIA SPP.	SAGEBRUSH	55.02	2.80	68.58	2.10	35.67	3.31	48.11	2.99
OTHER BROWSE		.60		1.00		8.35		1.14	
TOTAL BROWSE		75.54		95.40		90.11		73.89	
TOTAL		100.00		100.00		100.00		100.00	

Table 2. FOOD HABITS SUMMARY FOR PERIOD SPRING 1973

PER CENT RELATIVE DENSITY OF PLANT FRAGMENTS DISCERNED IN FECAL MATTER

		BIGHORN SHEEP		PRONGHORN ANTELOPE		MULE DEER		ELK	
		MEAN	SE	MEAN	SE	MEAN	SE	MEAN	SE
GRASS AND GRASSLIKE PLANTS									
FESTUCA SPP.	FESCUE	10.71	.81	.51	.20	1.80	.72	15.98	1.22
POA SPP.	BLUEGRASS	3.41	.68	.99	.45	2.95	.86	6.52	.84
AGROPYRON SPP.	WHEATGRASS	1.47	.36	.82	.46	1.35	.52	5.48	.72
DANTHONIA SPP.	OATGRASS	1.05	.61	0.00	0.00	.25	1.77	5.31	1.77
MUHLENBERGIA SPP.	MUHLY	15.85	1.83	2.15	.34	1.37	.29	7.93	.90
STIPA SPP.	NEEDLEGRASS	2.27	.59	.20	.20	.47	.23	2.55	.46
CAREX SPP.	SEDGE	6.07	.92	.47	.18	3.62	.85	8.24	.89
JUNCUS SPP.	RUSH	3.82	1.45	0.00	0.00	.68	.57	1.41	.31
OTHER GRASS		7.53		.95		3.51		8.82	
TOTAL GRASS		52.19		6.10		16.01		62.25	
FORBS									
POTENTILLA SPP.	CINQUEFOIL	3.95	.52	4.93	.60	1.41	.25	2.90	.60
OTHER FORBS		3.39		15.26		6.41		4.85	
TOTAL FORBS		7.34		20.19		7.81		7.75	
BROWSE									
JUNIPERUS SPP.	JUNIPER	.06	.16	.53	.37	4.50	.85	.06	.31
PINUS SPP.	PINE	.89	.26	.52	.46	5.45	2.37	.90	.25
PSEUDOTSUGA SPP.	DOUGLAS FIR	1.36	.45	2.22	.51	3.07	.78	1.31	.31
SALIX SPP.	WILLOW	.03	.23	0.00	0.00	9.62	5.77	4.29	.78
RIBES SPP.	CURRANT	3.01	.68	8.22	1.08	8.97	1.79	.47	.29
CERCOCARPUS SPP	MOUNTAIN MAHOGANY	4.18	.95	2.04	.53	6.04	2.09	.53	.36
SYMPHORICARPUS SPP.	SNOWBERRY	3.66	1.26	1.30	.44	2.30	.81	.46	.55
CHRYSOTHAMNUS SPP.	RABBITBRUSH	.18	.13	6.73	1.01	1.43	.47	1.44	.35
ARTEMISIA SPP.	SAGEBRUSH	22.01	2.68	42.85	2.91	29.65	3.35	14.36	2.38
OTHER BROWSE		5.08		9.31		5.15		6.14	
TOTAL BROWSE		40.47		73.71		76.18		29.96	
TOTAL		100.00		100.00		100.00		100.00	

Table 3. FOOD HABITS SUMMARY FOR PERIOD SUMMER 1978

PER CENT RELATIVE DENSITY OF PLANT FRAGMENTS DISCERNED IN FECAL MATTER

		BIGHORN SHEEP		PRONGHORN ANTELOPE		MULE DEER		ELK	
		MEAN	SE	MEAN	SE	MEAN	SE	MEAN	SE
GRASS ANO GRASSLIKE PLANTS									
FESTUCA SPP.	FESCUE	3.83	.66	.25	.30	.29	.29	12.49	1.26
POA SPP.	BLUEGRASS	1.19	.38	.03	.16	.12	.27	4.31	.60
AGROPYRON SPP.	WHEATGRASS	4.14	1.16	.12	.69	.10	.22	4.17	.76
MUHLENBERGIA SPP.	MUHLY	9.82	1.72	.93	.25	.08	.16	1.93	.37
BOUTELOUA SPP	GRAMA	4.94	1.42	.07	.16	.04	.27	.28	.87
CAREX SPP.	SEDGE	8.93	1.23	.63	.20	.28	.41	14.51	1.21
OTHER GRASS		5.73		.50		.40		8.79	
TOTAL GRASS		38.59		2.54		1.31		46.48	
FORBS									
ERIOGONUM SPP.	ERIOGONUM	.99	.73	8.97	1.26	1.08	.58	7.27	.97
KOCHIA SPP.	SUMMERCYPRESSS	1.19	.59	1.46	.31	2.83	.89	1.06	.45
POTENTILLA SPP.	CINOUEFOIL	4.04	.85	10.94	1.11	1.88	.37	8.75	.70
COMPOSITAE	COMPOSITE FAMILY	.65	.38	3.54	.44	.09	.39	.92	.39
UNKNOWN SPP.	UNKNOWN SPP.	2.19	.33	1.10	.31	.78	.29	1.72	.45
OTHER FORBS		4.44		8.28		.87		7.09	
TOTAL FORBS		13.52		34.29		7.53		26.80	
BROWSE									
SALIX SPP.	WILLOW	4.23	1.16	.17	.52	74.58	2.38	2.41	.94
ATRIPLEX SPP.	SALTBUSH	6.85	2.18	.10	.23	0.00	0.00	.12	.25
RIBES SPP.	CURRANT	1.72	.32	2.15	.50	1.93	.74	2.47	.62
CERCOCARPUS SPP	MOUNTAIN MAHOGANY	18.65	2.89	19.95	2.14	2.67	.68	1.33	.58
ROSA SPP.	ROSE	1.44	.32	.21	.28	6.83	1.20	.17	.19
RHUS SPP	SUMAC	2.08	.51	1.49	1.90	3.49	1.01	0.00	0.00
SHEPHERDIA SPP	BUFFALOBERRY	0.00	0.00	0.00	0.00	0.00	0.00	8.84	1.75
CHRYSOTHAMNUS SPP.	RABBITBRUSH	.85	.41	9.47	1.39	.24	.23	1.65	.44
ARTEMISIA SPP.	SAGEBRUSH	3.90	.77	25.80	2.09	.38	.41	4.65	.83
OTHER BROWSE		8.18		3.82		1.04		5.09	
TOTAL BROWSE		47.89		63.18		91.16		26.71	
TOTAL		100.00		100.00		100.00		100.00	

Table 4. FOOD HABITS SUMMARY FOR PERIOD FALL 1978

PER CENT RELATIVE DENSITY OF PLANT FRAGMENTS DISCERNED IN FECAL MATTER

		BIGHORN SHEEP		PRONGHORN ANTELOPE		MULE DEER		ELK	
		MEAN	SE	MEAN	SE	MEAN	SE	MEAN	SE
GRASS AND GRASSLIKE PLANTS									
FESTUCA SPP.	FESCUE	6.43	.86	.24	.29	.30	.42	6.37	1.11
POA SPP.	BLUEGRASS	1.80	.38	0.00	0.00	.50	.70	6.20	.78
AGROPYRON SPP.	WHEATGRASS	3.16	.44	.31	.36	.19	.84	4.75	.70
MUHLENBERGIA SPP.	MUHLY	8.73	1.06	.65	.31	.16	.15	3.90	.55
STIPA SPP.	NEEDLEGRASS	1.08	.23	.04	.31	.06	.29	6.28	.91
BOUTELOUA SPP	GRAMA	5.51	.63	.03	.23	.14	1.01	.42	.26
CAREX SPP.	SEDGE	2.96	.46	.51	.41	2.71	.57	7.41	1.49
OTHER GRASS		6.55		.16		.28		4.90	
TOTAL GRASS		36.22		1.94		4.34		40.24	
FORBS									
POTENTILLA SPP.	CINQUEFOIL	.26	.19	4.07	1.44	6.21	2.04	2.76	.57
LUPINUS SPP.	LUPINE	0.00	0.00	.55	.35	6.64	3.63	2.87	.97
OTHER FORBS		3.13		7.83		7.26		3.26	
TOTAL FORBS		3.39		12.45		20.11		8.89	
BROWSE									
JUNIPERUS SPP.	JUNIPER	.15	1.07	0.00	0.00	10.40	2.15	0.00	0.00
PINUS SPP.	PINE	.06	.16	.73	2.09	4.09	1.09	1.13	.43
PSEUDOTSUGA SPP.	DOUGLAS FIR	.36	.23	2.31	1.06	6.93	1.28	1.17	.56
YUCCA SPP.	YUCCA	1.88	.38	.24	1.65	.18	.40	4.64	1.62
SALIX SPP.	WILLOW	.03	.18	0.00	0.00	5.65	4.50	.10	.24
ATRIPLEX SPP.	SALTBUSH	28.27	2.23	18.24	3.29	9.80	2.68	5.98	1.61
EUROTIA SPP	WINTERFAT	5.85	1.22	.22	.77	.60	.31	12.09	3.23
BERBERIS SPP.	BARBERRY	0.00	0.00	.03	.24	1.97	3.70	4.35	3.75
CERCOCARPUS SPP	MOUNTAIN MAHOGANY	1.51	.56	.85	.51	5.18	1.21	.32	.26
CHRYSOTHAMNUS SPP.	RABBITBRUSH	1.88	.63	37.17	2.05	11.49	2.14	7.01	1.69
ARTEMISIA SPP.	SAGEBRUSH	19.91	2.27	23.93	2.42	10.51	1.46	6.51	.87
OTHER BROWSE		.49		1.88		8.76		7.59	
TOTAL BROWSE		60.39		85.61		75.55		50.87	
TOTAL		100.00		100.00		100.00		100.00	

Table 5. FOOD HABITS SUMMARY FOR PERIOD YEAR-ROUND 1978

PER CENT RELATIVE DENSITY OF PLANT FRAGMENTS DISCERNED IN FECAL MATTER

		BIGHORN SHEEP		PRONGHORN ANTELOPE		MULE DEER		ELK	
		MEAN	SE	MEAN	SE	MEAN	SE	MEAN	SE
GRASS AND GRASSLIKE PLANTS									
FESTUCA SPP.	FESCUE	6.66	.42	.32	.14	.95	.36	10.59	.64
POA SPP.	BLUEGRASS	2.05	.25	.32	.31	1.12	.44	4.94	.37
AGROPYRON SPP.	WHEATGRASS	2.25	.35	.38	.25	.47	.24	4.17	.36
MUHLENBERGIA SPP.	MUHLY	10.44	.79	1.10	.16	.53	.14	4.27	.34
CAREX SPP.	SEDGE	4.89	.42	.51	.14	2.12	.33	8.12	.61
OTHER GRASS		11.51		.78		1.71		11.80	
TOTAL GRASS		37.79		3.42		6.90		43.89	
FORBS									
POTENTILLA SPP.	CINQUEFOIL	2.09	.36	4.95	.67	2.63	.53	3.56	.43
OTHER FORBS		4.45		12.13		7.77		7.58	
TOTAL FORBS		6.54		17.08		10.40		11.14	
BROWSE									
JUNIPERUS SPP.	JUNIPER	.22	.50	.23	.22	6.70	.90	.05	.16
PINUS SPP.	PINE	.62	.25	.57	.31	4.14	.91	1.70	.26
PSEUDOTSUGA SPP.	DOUGLAS FIR	.71	.17	1.60	.33	4.25	.61	2.50	.39
SALIX SPP.	WILLOW	.99	.88	.04	.52	22.36	3.44	1.74	.57
ATRIPLEX SPP.	SALTBUSH	11.11	1.36	7.24	1.75	5.76	1.19	2.13	.72
EUROTIA SPP	WINTERFAT	4.00	.54	.30	.31	.94	.67	3.87	1.21
RIBES SPP.	CURRANT	1.23	.39	2.74	.72	3.16	.70	.73	.34
CERCOCARPUS SPP	MOUNTAIN MAHOGANY	5.94	1.11	5.39	1.13	4.14	.68	.62	.20
CHRYSOTHAMNUS SPP.	RABBITBRUSH	.84	.23	18.38	1.10	4.51	.74	3.49	.49
ARTEMISIA SPP.	SAGEBRUSH	24.86	1.60	39.64	1.63	19.13	1.77	17.79	1.52
OTHER BROWSE		5.10		3.36		7.57		10.34	
TOTAL BROWSE		55.64		79.49		82.68		44.97	
TOTAL		100.00		100.00		100.00		100.00	

Table 6. Food items in May-October, 1978 cattle diet and December-June, 1978-1979 bighorn diet as determined by microhistological analysis of feces.[1]

Food Item	Percent in Diet Cattle	 Bighorn
Grass and grass-like		
Muhlenbergia spp.	22	11
Bouteloua gracilis	11	11
Agropyron spp.	8	2
Festuca spp.	7	3
Sporobolus cryptandrus	3	5
Oryzopsis spp.	_	2
Carex spp.	9	10
Juncus spp.	10	-
Forbs		
Descurainia obtusa	-	2
Sphaeralcea coccinea	-	2
Browse		
Atriplex spp.	5	7
Artemisia spp.[2]	4	10
Ceratoides lanata	4	8
Yucca spp.	tr	4
Salix spp.	-	2
Symphoricarpos palmeri	-	2
Potentilla spp.[3]	1	1

[1] Only food items constituting at least 1 percent of the diet of either cattle or bighorn are included.

[2] Mostly *A. frigida*.

[3] Herbaceous *Potentilla* species occur on the study area but most of this genus consumed is considered to be *P. fruticosa*.

tr = less than 1 percent.

Table 7. Standing crops and removal of forage from winter-spring critical areas of bighorn sheep in 3 BLM allotments, Trickle Mountain study area, summer 1979.

Allotment	No. of Critical Areas	Standing Crop ($Kg x 10^3$)	Amount Removed ($Kg x 10^3$)	Utilization (%)
Poison Gulch	5	121	5.0	4
Trickle Mountain	8	131	9.5	7
Cross Creek	8	260	92.0	35

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Table 8. Numbers of ungulates observed on bighorn winter-spring critical areas within 3 BLM allotments on the Trickle Mountain study area, June-October, 1979.

Allotment	Cattle	Bighorn	Pronghorn	Mule Deer
Poison Gulch	31	35	0	1
Trickle Mountain	34	0	6	0
Cross Creek	148	50	0	0
Totals	213	85	6	1

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